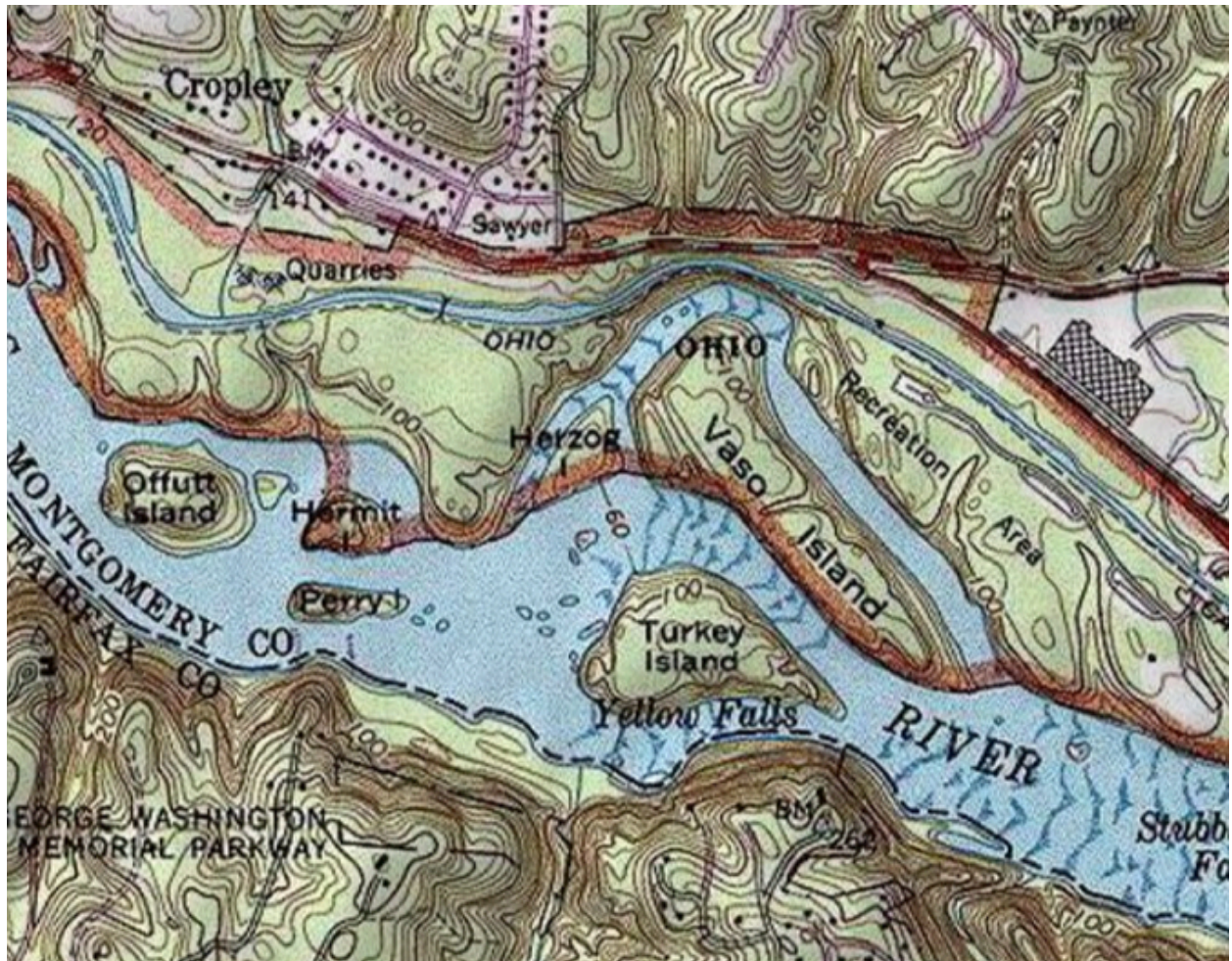


MONTGOMERY COUNTY FIRE & RESCUE SERVICE
SWIFT WATER RESCUE TEAM
INTERNAL SAFETY REVIEW



Loss of JB730B at Yellow Falls on the Potomac River
Training Operations
December 14, 2016



Written by:
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By the Authority of:
Captain Joseph Bell

Approved by:
Assistant Chief Maurice Witt

On December 14, 2016 Montgomery County's Swift Water Rescue Team was conducting training operations on the Potomac River in the area of Yellow Falls when a Jon Boat sank and one person was injured. Due to the nature of the event the Swift Water Rescue Team Leader directed the Swift Water Rescue Team Safety Officer, to conduct an internal review of the events surrounding the incident. The following report is the findings and recommendations of said report ordered by the Swift Water Rescue Team Leadership.

Overview

Montgomery County Fire and Rescue Service (MCFRS) has determined that they shall attempt to set aside time on one day each month to allow for the personnel assigned to the Swift Water Rescue Team (SWRT) to focus solely on learning and refining the skills they need to operate in a water environment. This equates to three training days a month, one for each shift. On December 14, 2016 the SWRT had been assigned a training detail from 1000 to 1700. Fire Station 30, one of two fire stations that house swift water rescue assets, had elected to conduct training on the Potomac River. The focus of the training was to provide time and experience to personnel who were working on becoming Swift Water Boat Operators (SWBO); specifically, operating a Jon Boat at low water levels on the Potomac River. The assets from Station 30 that were used during the training were, Jon Boat 730 (JB730), Jon Boat 730B (JB730B) and Boat 730B (BT730B). The planned route of travel would be from the Angler's Inn Boat Ramp south to Scott's Run and return to Angler's Inn Boat ramp. The trip south to Scott's Run was uneventful. The route back to Angler's Inn Boat Ramp took the team on a different path and brought them to the base of Yellow Falls. At 1300 hours JB730B made an attempt to run up Yellow Falls and was unsuccessful. JB730B swamped and became pinned on a rock. The two swift water personnel who were in the boat were able to exit the boat onto a nearby rock. An effort was made to recover JB730B. After involving additional swift water assets that were not originally part of the training, the recovery effort was called off due to darkness. Around 1700 one of the swift water personnel, who had been in JB730B when it swamped, reported an injury to his supervisor. He went home and later sought medical attention from an Emergency Department. Members of the MCFRS SWRT salvaged JB730B on December 18, 2016.

Events leading up to the Loss of JB730B

Captain “A” had been hired on overtime to cover for Captain “B” while he attended a regional special operations meeting. Captain “B” was due back at 1400, so the on water training detail was shortened from 1700 to 1400. The training topics for the day were hypothermia, low head dams and ice rescue. At the last minute a back fill became available and the boats could now go out on the water. Captain “B” and Captain “A” discussed what training should occur during his absence now that the team could train on the water. The plan was to utilize BT730 and BT730B and proceed up stream from the Angler’s Inn Boat Ramp. The plan was changed by Captain “A” after speaking to several of the personnel from Station 30C who were working on becoming boat operators. One of the requirements to become a boat operator is to navigate a Jon Boat from Angler’s Inn Boat Ramp to Scott’s Run at a water level below 3.3.¹ The Swift Water Rescue Team uses the National Weather Service (NWS) Potomac River Little Falls Pumping Station Gauge (NWS Gauge BRKM2) to measure the water level of the Potomac River.² The water level on December 14, 2016 was 3.1.³ In order to take advantage of the water level and assist the trainees in getting work done on their packets; the decision was made to launch two Jon Boats (an aluminum rigid hull boat) and a Sled (a multi-chambered inflatable boat) and make the trip to Scott’s Run so that the three trainee operators could work on that portion of their Operator’s Task Book. The SWRT Crew members who were working on their Operator’s Task Book were, Firefighter “C”, Master Firefighter “D” and Master Firefighter “E”.

Boats were launched from Angler’s Boat Ramp around 1130 hours. BT730B, JB730 and JB730B proceeded down stream. They stayed on the Maryland side (river left) of the river and passed by Carder Rock Climbing area before cutting across the river to the Virginia side (river right) to Scott’s Run. From Scott’s Run they preceded up stream, staying river right hoping there would be more water. They had a difficult time coming down stream on river left; having to get out of the boats several times to get the boats off of rocks. The course up stream, river right, took the boats to Yellow Falls.

Events at Yellow Falls

Yellow Falls is a set of rapids that sits just below the northwest corner of Turkey Island.⁴ At approximately 1300, JB730B made two attempts to get up Yellow Falls with Swift Water Boat Operator Trainee (SWBOt) “C” at the helm and SWBO “F” in the crew position. SWBOt “E” attempted and was successful in running BT730B up Yellow Falls using the same path that JB30B had just attempted to use. BT730B with SWBOt “E” and SWBO “G” held station above the falls waiting for the other boats to make their runs. SWRT members “C” and “F” switched positions with SWBO “F” at the helm and SWBOt “C” in the crew position. SWBO “F” made an attempt to run the falls. During this attempt the bow of JB730B was pushed river right by a wave. At the same time the motor was pushed out of the water. This caused the boat to lose forward momentum. When the bow of JB730B was pushed river right it hit a rock and high sided. Water started to pour over the starboard side of the boat. With the boat having no forward momentum it was quickly flooded by the incoming water. SWRT members “C” and “F” scrambled onto a nearby rock. Both made an attempt to hang onto the boat to prevent it from being swept down stream. SWBO “F” let go first. SWBOt

“C” continued to try to hold onto the boat and was pulled into the water. He released the boat and was able to swim to the Virginia shore. JB730B floated, partially submerged, down stream approximately 30 feet where it became pinned on a rock. The boat was pinned on a rock in such a manner that the port side of the boat became completely submerged with the top of the starboard side sticking partially out of the water. The bottom of the boat was against a rock with the bow pointing towards Maryland and the transom facing Virginia.

Recovery of JB730B

Captain “A” (SWBO) and the rest of the personnel made several attempts to recover JB730B using mechanical advantage systems. Captain “A” contacted Captain “B” (Team Leader) and requested one additional resource and additional rope equipment to “help with a boat that was stuck on a rock.” Captain “B” contacted Station 10 around 1415 and spoke with Lieutenant “H” (Swift Water Officer) who sent FF “I” (SWBO) and FF “J” (SWBC) with BT710B to assist. Lieutenant “H” stayed at Station 10 to keep E710 in service. After contacting Lieutenant “H”, Captain “B” notified ECC, BC702, and the Special Operations Battalion of the situation. During this time Captain “K” (SWBO) was at CMF switching out T710. While he was returning to Station 10, around 1445, he received a phone call from Captain “B” asking him to proceed to Yellow Falls and assist crews with the recovery of JB730B. Upon arrival at Station 10, Captain “K” took BT710 with Master Firefighter “L” (SWBO), Master Firefighter “M” (SWBC) and Firefighter “N” (SWBO) to the Angler’s Inn Boat Ramp. Captain “K” met up with Captain “B” at Angler’s and was briefed of the situation. Captain “K” arrived at Yellow Falls and discussed with Captain “A” what had been attempted to free JB730B. Captain “K” states “previous attempts of trying to pull the boat upstream and towards the Virginia shore were not working” so he developed a different strategy of setting up a system and pulled towards the Maryland shoreline. Captain “K” reported that he had been able to move JB730B 12 to 18 inches, but was unable to free the boat. Around 1700 Captain “B” suspended operations due to darkness.

Injury of FF “C”

Upon arrival to Angler’s Inn Boat Ramp SWBOt “C” reported that his right leg was injured and his shoulders were sore. A first report of injury was completed and FF “C” went home. He later sought treatment from an Emergency Department close to his home.

FF “C’s” statement indicates that when he and SWBO “F” exited JB730B they tried to hold onto the boat to keep it from further flooding and going down stream. SWBO “F” was the first to let go. This left SWBOt “C” holding the entire weight of the boat, water in the boat and the force of the water entering the boat. The weight of the boat, combined with slippery footing caused SWBOt “C” to be pulled into the water. He stated that he was under water “approx. 2-3 sec and popped right up.” It is unclear as to when the leg injury occurred. It is likely to have occurred when exited the boat or when he was pulled into the water.

Salvage of JB730B

During the days following the incident of pinning JB730B in Yellow Falls, SWR Team Leaders developed an Incident Action Plan (IAP) to salvage JB730B.⁵ On December 18, 2016 members of the SWRT were able to salvage JB730B. The boat was retrieved in three independent pieces. The motor was not recovered and remains pinned between two rocks below the surface of the water. The plan is to return to Yellow Falls in the summer of 2017 to see if the motor is visible when the water level is at its seasonal low to determine if it can be salvaged as well.

Technical Specs and Known Issues of JB730B

- JB730B Purchased in 1995
- Stock # 9-95-E495
- Make: Alumacraft Model: 1436LT
- Center Line Length: 14 ft
- Beam: 57"
- Weight: 165 pounds – empty
- 40hp Motor Max
- Max Weight Capacity: 3 persons or 430lbs
- JB730B was identified as the next Jon Boat due to be replaced due to design issues.
 - JB730B has a flat bow
 - The rest of the fleet have a Modified V bow.
 - JB730B has a deck dimension of 36".
 - The rest of the fleet have a deck dimension of 40"
- Formal request for replacement made one year ago
- Motor: JB730C Purchased 1994
- Stock # 9-94-7555
- Mercury 15hp – 2 Stroke
- Propulsion: Standard shaft 9x9 propeller
- Last Serviced: November 26, 2016

Contributing Factors

The following events are considered contributory to the loss of JB730B:

- Captain "B's" detail caused on water training to be shortened by three hours.
- The initial plan developed by Captain "B" and Captain "A" to train upstream of Angler's Inn Boat Ramp was not followed.
- JB730B's design is different than all other Jon Boats in the county.
 - The hull design of JB730B causes it to react differently then other Jon Boats to moving water.
 - Due to the flat design of the bow, JB730B's bow can move in unpredictable directions.
 - The narrow width of JB730B makes it more prone to tipping then the rest of the fleet.

- JB730B had been slated for replacement due to its age and poor design.
- Prolonged exposure to cold air and water reduces decision-making ability.
- Inexperience SWRT members operating down stream of Angler's Inn Boat Ramp during the winter months.
- Lack of understanding of Jon Boat limitations and uses by SWRT members.
- There was short notice on the back fill that allowed for the on water training.

Direct Cause of the Loss of JB730B

JB730B was lost when the starboard bow of the boat began taking on water. The boat had no forward momentum; which prevented the crew from counter steering when the bow of the boat moved river right and high-sided. The bow of the boat high sided on a rock causing the crew to shift inside the boat. This shift inside the boat placed the majority of the weight in the boat to be placed on the starboard side of the boat (low side). This caused the starboard side of the boat to be forced further underwater allowing more water to enter the boat. At this point the only hope of recovering the boat would have been for it to float free of the falls and for SWRT members to be able to get the submerged boat to shore. Unfortunately, this was not the case. JB730B floated through Yellow Falls until the starboard side stuck another rock. This caused the port side to completely sink and the starboard side to rise out of the water. With the maximum amount of interior surface exposed to down stream forces the boat would be bent around the rock making it unrecoverable. It is unclear when the motor became wedged. It could have happened when JB730B initially pinned or at a later time during the recovery attempts.⁶

Conclusion

The SWRT has been operating Jon Boats on the Potomac River for more than 20 years. To date, this is the second Jon Boat that has been lost by the SWRT. Operating a Jon Boat in the Potomac River is an essential skill that every Swift Water Boat Operator should have. The Jon Boat's primary mission is to be used in floodwater. The best way to acquire the experience needed to operate a Jon Boat in floodwaters is to operate it in the Potomac River. What most people fail to understand is that every time a Jon Boat enters the water there is a chance that it will sink. Jon Boats are not self-bailing and have minimal inherent flotation. The chance of one sinking only goes up when it enters moving water. This is why it is so important for the SWRT Boat Operators to learn how to operate a Jon Boat in moving water.

Jon Boats that have a flat bow require additional horsepower due to the increased surface area. They also can move in an unpredictable manor when struck by waves due to the flat bow. A narrow beam provides less stability and makes the boat more prone to tipping. JB730B had both of these design elements. It is impressive that the boat had not been lost many years ago. It should be noted that that JB730B was slated for replacement because of these issues.

Running Yellow Falls in a Jon Boat has inherent issues. Compounding these issues was the water level and the cold environment. The core issue was not that JB730B filled with water

and was lost, but why did JB730B end up in that situation in the first place. As with all catastrophic events it is not a single decision or items that is the direct cause of the event in question. There are always items or causations that could have been avoided that would have changed the out come. In reviewing the events proceeding up the running of Yellow Falls here are the reasons that JB730B ended up at Yellow Falls.

- The original plan established by the shift officer was deviated from.
 - A detailed officer allowed the crew to dictate the needs of the training instead of following the prescribed plan for the day.
- A lack of understanding by the officer running the drill on the hazards of going to Scotts Run and back with the given water level and air and water temperatures.
 - There was no Swift Water Officers (SWO) on the training. Although there was a Captain and two Master Firefighters on the training, there were no SWRT personnel who were experienced enough to recognize the flaws in going south for a training evolution at the river level and time of year.
 - There was a senior Firefighter III who did have the experience to recognize the flaws in the plan, but did not say anything.
- Protracted training time frame.
 - SWRT training takes time; especially when the training is going to be conducted on the water. In an effort to get Captain “A” back to Station 30 to be relieved by Captain “B” without incurring additional overtime was problematic. It prevented the option of turning around at Yellow Falls and finding another route back to Angler’s Inn Boat Ramp due to the time constraints.
- Jon Boats have limitations that are not readily understood by SWRT members.
 - Most SWRT members see the Jon Boat as a platform to be used in shallow water. Therefor, when they see the Potomac River at “low water” they assume that it is an appropriate platform to use.
 - This, again, goes with SWRT personnel with little swift water experience making decisions because of their fire department rank.

Recommendations

- Review with all SWRT personnel the uses and limitations of Jon Boats.
- Review with all SWRT personnel the difficulties of proceeding down stream from Angler’s Inn Boat Ramp.
- Review SWRT policies on operations south of Angler’s Inn Boat Ramp
- Review the Boat Operator Task Book – Boat Operations section on operating a Jon Boat from Angler’s to Scotts Run.
- SWRT leadership needs to work out ways for officers assigned to the SWRT can gain more experience and make better decisions. This is especially important when there is no SWO available.
- SWRT leadership should look at minimum staffing for the SWO position.
 - This should include mandatory staffing of the SWO position for all on water training events.
- SWRT should look at the requirements for the SWO position to see if any adjustments need to be made.

- Review SWRT lesson plans to insure Crew Resource Management (CRM) is embedded into all SWRT curriculums.
- Inspect the MCFRS Jon Boat fleet to insure there are no other Jon Boats similar in style to JB730B
- SWRT Leadership should evaluate the SWRT fleet to see if there is the proper compliment of boats to support the typical conditions the SWRT operates under.
- SWRT Leadership to look industry wide at other platforms that are performing the same or similar functions as the Jon Boats to see if there is a suitable replacement for the Jon Boats.

Summation

The loss of any boat or boat motor deserves scrutiny and a review of current practices. Anytime a team member is injured, safety procedures need to be reviewed. The combination of the two event types are entirely deserving of a hard, internal look at training policies, operational policies and safety practices. The review of the of JB730B at Yellow Falls on December 14, 2016 has identified several issues that need to be addressed by the Swift Water Rescue Team, the Special Operations Section Chief and the Operations Division Chief.

The Swift Water Rescue Team needs to look at its operational policies that include training operations south of the Angler's Inn Boat Ramp. They also need to look at their lesson plans that involve the use of Jon Boats to ensure that the pros and the cons of a Jon Boat is understood at all levels of the team. They also need to review their Boat Operators Task Book to determine if the section on Jon Boats needs to be modified. Finally they need to work with Special Operations to refine the position of Swift Water Officer and determine if there should be a minimum staffing requirement for that position.

Special Operations needs to be more responsive to equipment requests. The Swift Water Rescue Team has been under funded for many years. Much of their essential equipment is reaching or has surpassed its life expectancy.⁷ The need for replacing JB730B was identified several years ago. It was articulated at that time that the need for replacement was not solely on life expectancy, but primarily due to safety concerns. Until JB730B was lost, there was still no hard time line to replace it.

The Operations Division needs to ensure that the SWRT gets as much time to train as possible.⁸ Training details are often times shortened or eliminated due to other operational constraints or to minimizing overtime. The SWRT leadership understands that they are competing with many other operational needs, however the Operations Division should know that SWRT training is different than any other Special Operations Team training. Once the SWRT engages in on water training, time constraints can lead to making compromising decisions. COPDIs and other training exercises would help all involved with water operations understand the requirements and operational challenges that the SWRT faces every time it engages in training or rescue activities.

Montgomery County Fire & Rescue Services has one of the best trained and most experienced swift water rescue teams in the United States.⁹ In order for the MCFRS SWRT to maintain this status it will continue to conduct internal safety reviews and bring to light any issues it identifies, regardless of size or scope. It is hoped that the Special Operations Section, the Operations Division and MCFRS as a whole will welcome these recommendations and facilitated the changes that need to be made.

End Notes

¹ Swift Water Boat Operator Task Sheet – Boat Operation page 2

² <http://water.weather.gov/ahps2/hydrograph.php?wfo=lwx&gage=BRKM2&refresh=true>

³ Attachment #1 - NWS Graph of BRKM2 for Dec 14

⁴ Attachment #2 - Map A

⁵ JB730B IAP – Filed with the Special Operations Section on 18-December-2016

⁶ It should be noted that the fuel cell for JB730B was quickly recovered and thereby prevented the spilling of approximately five gallons of gasoline into the Potomac River.

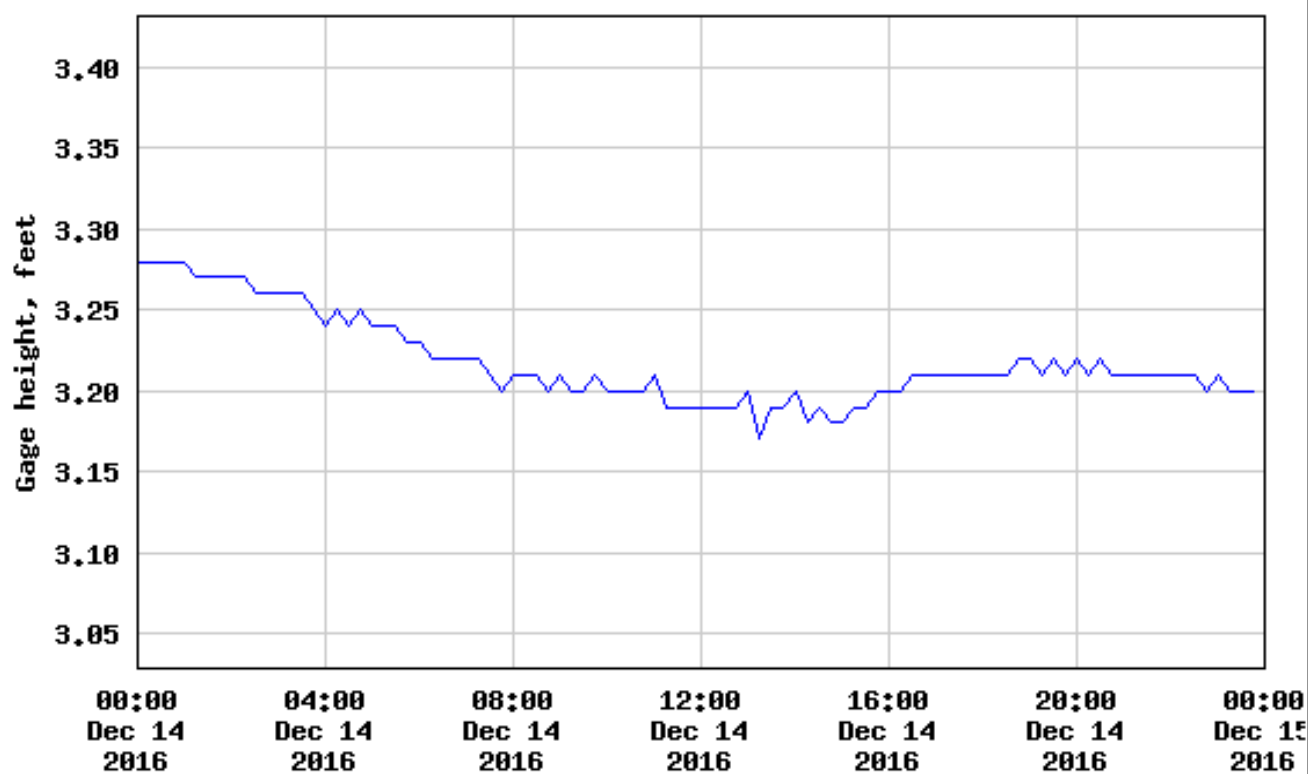
⁷ Attachment #3 – MCFRS Boat Age Spread Sheet

⁸ Attachment #4 – Training Time Requirements

⁹ Quote from Dave Demaree to Captain Paul Lancaster - <http://dibboats.com/executive-profiles.html>



USGS 01646500 POTOMAC RIVER NEAR WASH, DC LITTLE FALLS PUMP STA

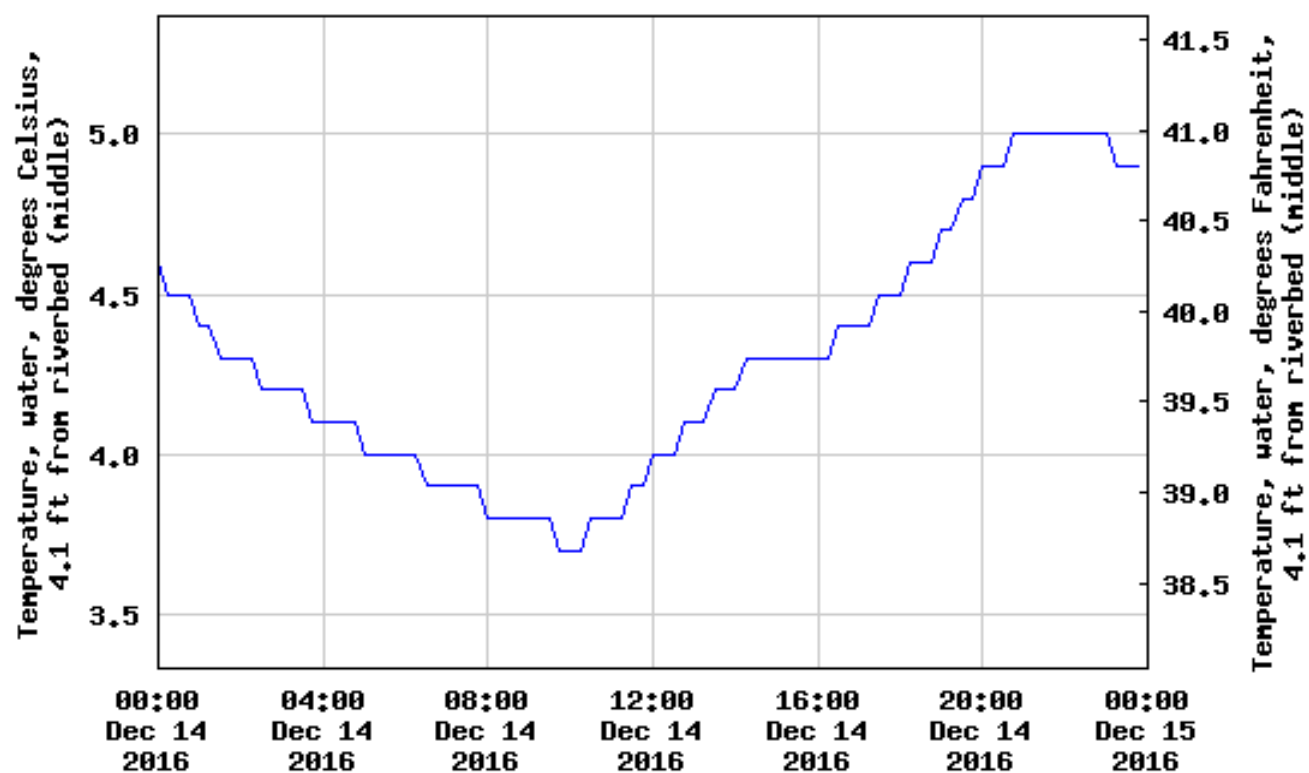


----- Provisional Data Subject to Revision -----

River Level at Little Falls Pumping Station 14-December-2016

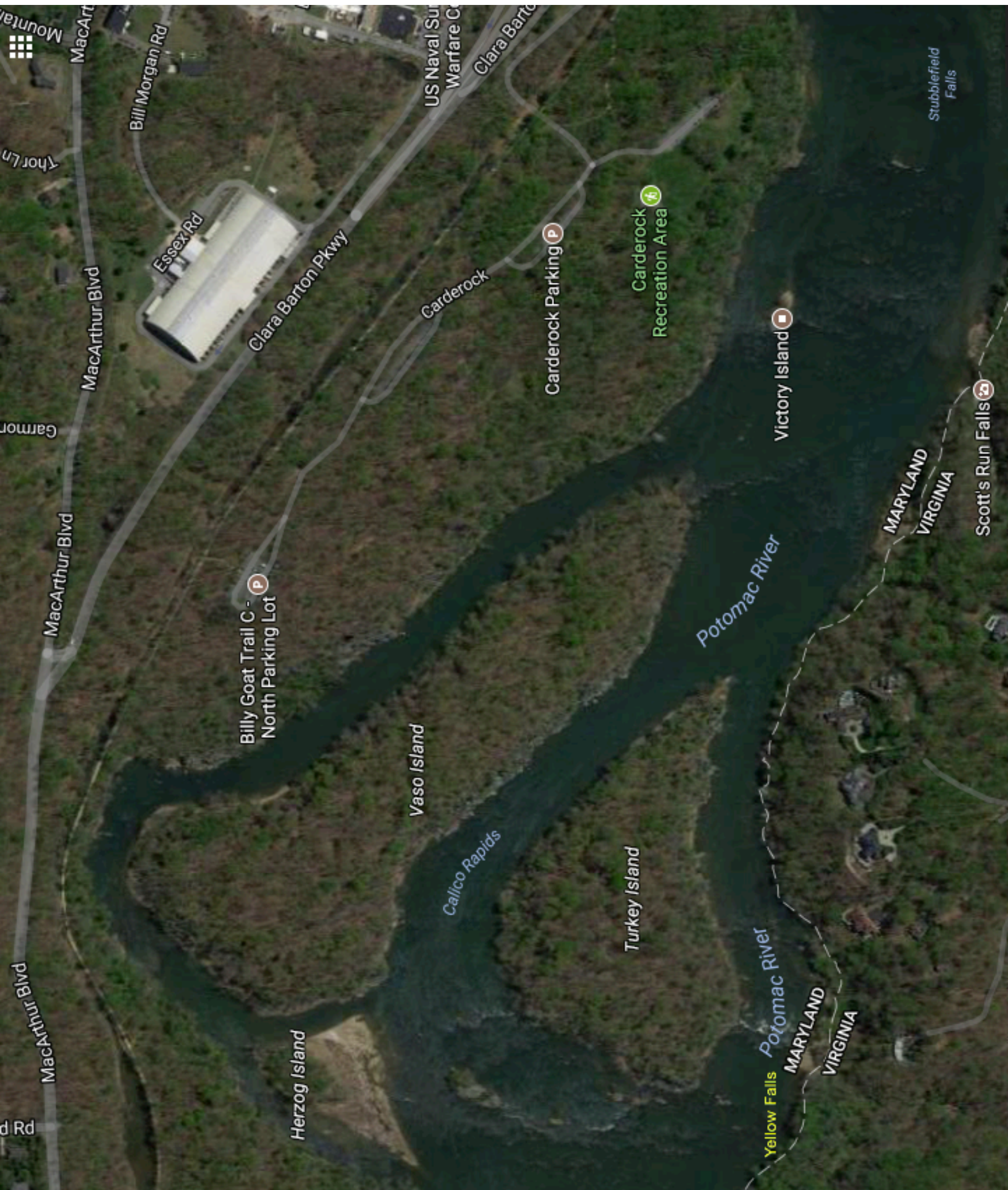


USGS 01646500 POTOMAC RIVER NEAR WASH, DC LITTLE FALLS PUMP STA



----- Provisional Data Subject to Revision -----

River Level at Little Falls Pumping Station 14-December-2016



Map A

Attachment #3

	A	B	C	D	E	F
1						
2	MCFRS Boat Age					
3						
4	Stock #	Unit #	House	Year	Model	Manufacturer
5	9-95-J495	BT704	4	1995	IRB W460	Avon
6	9-88-J990	BT704B	4	1988	ERB 310	Avon
8	9-08-G707	BT730C	10	2008	Chesapeake IRB	DIB
9	9-97-B797	BT730B	30	1997	Rescue Sled IRB	DIB
10	9-98-I898	BT710C	10	1998	Rescue Sled IRB	DIB
11	9-97-G797	BT710	10	1997	Chesapeake IRB	DIB
12	9-04-404A	JB710	10	2004	Jon Boat - Lowe Alum	Lowe Alum
13	9-01-K001	JB710B	10	2001	L1440M	Lowe Alum
14	9-10-010A	RDB710	10	2010	Quick Deploy	DIB
15	9-97-E797	BT714	14	1997	Roughneck	OMC (Lowe)
16	9-98-C898	BT714B	14	1998	Rescue Sled IRB	DIB
17	9-06-F606	BT725	25	2006	Rescue Sled IRB	DIB
18	9-12-4011	JB725B	25	2012	Jon Boat - Lowe Alum	Lowe Alum
19	9-10-G707	BT729	29	2010	Rescue Sled IRB	DIB
20	9-04-D404	AB730	30	2004	Air boat	
21	9-08-1080	BT730	30	2008	Chesapeake IRB	DIB
22	9-00-E000	BT710B	10	2000	Rescue Sled IRB	DIB
23	9-97-D797	BT771	10	1997	Chesapeake IRB	DIB
24	9-04-404B	JB730	30	2004	Jon Boat - Lowe Alum	Lowe Alum
25	9-95-E495	JB730B	30	1995	Jon Boat - Alumacraft	Alumacraft
26	9-10-010B	RDB730	30	2010	Quick Deploy	DIB
27	9-05-A505	BT731	31	2005	Rescue Sled IRB	DIB
28	9-12-6112	JB731B	31	2012	Topper 1232	Tracker Marine
29	9-05-B505	BT771B	71	2005	Rescue Sled IRB	DIB
30	9-08-L708	AB704	4	2008	Air boat AGI	Alumitech
31	9-11-I111	BT740	40	2011	Chesapeake IRB	DIB
32	9-12-D212	BT740B	40	2012	ERB 310	Avon
37	9-16-G516A	JB714	Dover	2016	1440M	Lowe
38	9-16-G516B	JB725	Dover	2016	1440M	Lowe
39	9-16-G516C	JB729	Dover	2016	1440M	Lowe
40	9-16-G516D	JB731	Dover	2016	1440M	Lowe

Breakdown of time required for RRATS Training

Training days / year = 12 x 8 hrs per day = 96 hours per year

Helo & Night Ops:	8 hours
Rope skills:	16 hours
Billy Goat Trail	3 hours
Blowouts, Contact Rescue, Self Rescue, Swimming, Swimmer tending, Tethered swimming, Throwbags:	8 hours
Boat Entry, Pickups	4 hours
Wading, Shallow water ops, Boat Flips, Boat Tows	8 hours
Seneca – Great Falls: 5 hrs on the water: all day (part of operator packet)	8 hours
Anglers – Little Falls: 5 hrs on the water: all day (part of operator packet)	8 hours
Operator packet hours 20 hours (- 14 hours already listed) =	6 hours
Ice rescue, Hypothermia	8 hours
Flood Ops, Lowhead Dam	2 hours
Boat Tows, Paddling	2 hours
Rescue Board, Swimmer Orientation, Area	8 hours
	89 hrs

The preceding list is a rough outline of how many hours are required for training every year. This assumes that everyone gets every topic on the one occasion when it is offered for the year. There is no accommodation to provide training to personnel who were off on a training day for whatever reason. None of the classroom topics or driver training are included at all.

The 96 hours assumes that we get every training day for the full day (this has never happened).

SWBC trainees are required to do all skills at least twice ; (Once for training and second for testing)	Practical skill hours = 37
SWBO trainees are required to do all skills at least twice ; (Once for training and second for testing)	Practical skill hours = 20
Initial training assuming every person attends every training session on the one time it is offered	89 hours
SWBC training to complete Taskbook testing	37 hours
SWBO training to complete Taskbook testing	20 hours
Grand total required per year	146 hours
Training time offered per year	96 hours

Only two of the entries include time for getting to training, setting up, breaking down and getting back to quarters. This averages at least two hours for every on the water training event.

Clean up time of about two hours for every on the water training is also not included in the above figures.

Also not included is time required to familiarize personnel with area and access to different locations.